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Abstract

This article examines the question of how climate change awareness and media usage are related to each other. An integrated model for explaining awareness of environmental problems and behavioural intentions is developed. The model is then tested using data from a Germany-wide representative survey. In contrast to most previous studies, this investigation focuses not on the effects of selective, topic-specific media usage, but on the differential effects of information usage on multiple dependent variables. The results show that media usage does have a certain influence on awareness of climate problems and on related behavioural intentions, but the results cannot be explained by a simple formula. The findings differ both with respect to the various dependent variables and across different media. The fact that media do not always have a mobilizing, awareness-enhancing effect is certainly one of the most interesting results of this study.

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Keywords

behavioural intentions, climate change, environmental awareness, environmental communication, Germany, media effects, media usage, online media, print media, television

Introduction

The threat of rising CO₂ emissions was described as early as the 1970s in the report *The Limits of Growth* published by the global think-tank Club of Rome, accompanied by the hope that use of fossil fuels would end before serious climatic consequences arose (Meadows et al., 1972). After interest in the topic subsided in the years that followed, an ongoing public debate has been rekindled in recent years. A diverse range of events and circumstances led to the revival of interest in this issue, including the 2004 disaster film *The Day After Tomorrow*, in which a catastrophic ice age occurs in the northern hemisphere as a result of climate change. Hurricane Katrina, which devastated the southeast of the United States in 2005, seemed like an all-too-real confirmation of the fictional dangers portrayed in the movie. The 2006 Oscar-winning documentary *An Inconvenient Truth*, about the relationship between CO₂ emissions and global warming, was seen in cinemas around the globe.

The topic did not just appear on international cinema screens, but also captured the headlines of the different informational media. Especially in the context of global 'events', like the report by the Intergovernmental Panel on Climate Change (IPCC) about anticipated consequences of climate change, the issue also received major attention in national media. In light of these events and their intense media coverage, it comes as no surprise that the topic of climate change is also an important issue on public agendas, e.g. in Europe (European Commission, 2008). According to the findings of the 2008 Eurobarometer, 62 percent of European citizens believe that climate change is the most serious societal problem (European Commission, 2008).

In comparison to other European countries, Germany is on the second highest level (70–79%) of climate change awareness, sharing it with Sweden, Norway, France, Finland and Hungary. As a reaction to the IPCC report in 2007, the German *Bild-Zeitung*, a tabloid with the highest circulation of all German daily newspapers,¹ headlined 'Our Planet is dying!' (3 February 2007) and *Süddeutsche Zeitung*,² a prestigious quality newspaper confirmed the same day: 'The catastrophe has already arrived'. The wide media coverage in Germany (Gramelsberger, 2007; Peters and Heinrichs, 2008) and the increasing importance of climate change in the population's perception (Kuckartz et al., 2007) can be seen as an indication of agenda-setting effects. Often the question arises as to whether media coverage influences the population's *climate-related environmental awareness* (e.g. Olausson, 2009). Hence this article seeks to throw light on some of these complex interrelations empirically regarding the case of Germany in 2007. We focus on the effects of different media types on climate change awareness and climate change behavioural intentions. In particular, we examine the impact of different public and commercial political television programmes, print media and informational online media. Also we consider diverse contextual variables concerning attitudes towards politics, social demographics and values orientation.

Theory

Theoretical concepts of environmental awareness research

Inspired by research in the US in the early 1970s, the phenomenon of environmental awareness also became a focus of research in Germany. Narrowly defined concepts specify environmental awareness as a purely cognitive construct, indicating whether someone is aware of the endangered environment (Matthies and Schahn, 2004). Broader concepts view environmental awareness as a multidimensional, integrative construct composed of diverse components. The research tradition of multi-component models focuses on two main questions: what components should or should not be assigned to the construct of environmental awareness, on the one hand, and what are the relevant factors influencing environmental behaviour, on the other. These diverse theoretical approaches and the empirical studies based on them led to the development of integrative concepts which take into consideration elements and dimensions from various approaches (see Matthies and Schahn, 2004; Stamm et al., 2000). Based on these considerations, an integrative variable model has been developed in the course of this study (Figure 1). Before presenting our analyses based upon this model, we give a short literature review about concepts from social science and psychological environmental awareness research, which we took into account to develop the variable model.

Measuring environmental behaviour

One of the most well-known concepts in the tradition of multi-component models is the Ecology Scale developed by Maloney and Ward (1973) to measure environmental awareness along four subscales (affect, knowledge, verbal and actual commitment). Based on the traditional three-component model of attitude (see Rosenberg and Hovland, 1960), they considered environmental awareness to be an attitude construct consisting of cognitive, affective and behavioural elements. In contrast to many other concepts, the Ecology Scale also integrated a behavioural component as a direct element of environmental awareness in the form of actual environmental behaviour in everyday situations and verbal commitment or intentions. The equivalent German scale system (SEU-3) also comprises seven environment-related areas of life: conserving household energy, environmentally friendly transport, sports and recreation, environmentally aware shopping, societal involvement, trash sorting and recycling, and water conservation and purity (Schahn, 1999).

Approaches to explain environmental behaviour

It became research practice to consider behavioural components separately from the mental level of environmental awareness. The objective of these more differentiated concepts is to ascertain interrelationships between emotional/affective and cognitive aspects of environmental awareness, on the one hand, and environmental behaviour, on the other hand, and furthermore to identify additional behaviour-relevant determinants. This research can be divided into an early explorative phase and a later deductive

phase. During both phases, behaviour-relevant determinants were identified that are relevant for our variable model.

The first phase gave rise to numerous studies whose objective was to identify and compare various factors of influence. One example is the structural model of environmental attitudes and behaviour by Grob (1995), who distinguishes between four behaviour-relevant constructs. In addition to *environmental awareness*, which comprises environmental attitudes and environmental perception in the model, *emotions*, *perceived control* (both general and environment-specific) and *personal-philosophical values* (material and post-material values) were taken into consideration. The results showed that personal-philosophical values and emotions had the strongest effect on environmental behaviour. Another example is the meta-analysis by Hines et al. (1986/7), summarizing the key results of 128 individual studies. Variables found to be significant were *verbal commitment*, *attitudes*, *locus of control*, *sense of responsibility*, *knowledge*, *economic orientation* and *sociodemographic variables*. Ultimately, environmental behaviour was most strongly influenced by the predictors verbal commitment ($r = .49$), locus of control ($r = .37$) and attitudes ($r = .35$).

According to the Theory of Planned Behaviour (Ajzen, 1991), a person's verbal commitment is largely determined by three dimensions: *attitudes towards behaviour*, the *subjective norm* and *perceived behavioural control*. This approach has been used to explain environment-relevant behaviour and was empirically confirmed, for instance in studies on using a bus route or shopping in a bio-shop (e.g. Bamberg, 2002).

In the Norm-Activation Model (Schwartz, 1977), by contrast, individual verbal commitment is determined primarily by the activation of personal norms. Study results confirmed *environmental perception*, *risk perception*, *recognition of behavioural consequences* and *awareness of responsibility and crisis* as key factors influencing environmental behaviour.

The role of media communication

Based on the previously described relevance of *problem and risk perception* and *environmental awareness* as factors of influence on environmental behaviour, it is apparent that the media play a special role in activating these perception processes. It is characteristic of many environmental problems that they are hardly perceived directly by human senses. Especially the causes and long-term effects of environmental problems lie beyond personal experience. On the other hand, some phenomena like extreme weather incidents are indeed observable, but it is not self-evident that they are perceived, for example, as indicators of global climate change. To connect a single observation with a general problem is the outcome of an interpretation process, in which media come into play. Luhmann (1989) already pointed out in the 1980s that environmental problems have to be made apparent and defined as problems through communication within a social frame of reference. Such collective attitudes then form the foundation for individual environmental awareness (Fuhrer et al., 1995). Attitudes towards the environmental situation thus constitute *social representations*, which are related to common knowledge (Stamm et al., 2000) and collective frames (Olausson, 2009) as well as societal values. Therefore, environmental communication through the mass media is tremendously

important in imparting this knowledge, consolidating these frames and values, as well as showing various possibilities of action (e.g. Lance et al., 2003; Nerb and Spada, 2001; Stamm et al., 2000).

Empirical results regarding media usage and environmental awareness

Two different research directions should be differentiated in analysing the relationship between media usage and climate change awareness: *Media-centred studies* analyse how environmental issues are presented in the media and hypothesize what effects this coverage may have. *Receiver-centred studies* deal with the question of how media usage affects the perception and evaluation of environmental problems as well as environmental attitudes and behaviour.

Mediacentred studies about the coverage in the US showed that cautionary as well as more sceptical voices regarding the existence of climate change get attention in the media. Both the findings of Brossard et al. (2004), who analysed newspapers between 1987 and 1997, and of Boykoff and Mansfield (2008), who analysed television news from 1995 to 2004, indicate that the American media gave attention to both sides over the whole period of investigation. However, Antilla's (2005) findings regarding the newspaper coverage during the time period from 2003 to 2004 and Zehr's (2000) analysis of articles published by the US popular press between 1986 and 1995, both reveal that presentations of 'scientific uncertainty' dominate and that climate change is framed by scepticism and controversy. This is in contrast to Olausson (2009: 429), who identified a 'frame of certainty' in Swedish newspapers between 2004 and 2005 emphasizing the existence of global warming. A German study on 'construction of risk' points in the same direction concerning climate change in the mass media after the 2007 IPCC report was published. Peters and Heinrichs (2008: 14) observed that the media coverage about climate change closely mirrors the position of the scientific community as documented in the IPCC reports. Gramelsberger (2007), on the other hand, came to different conclusions. She analysed articles in *Der Spiegel* (see note 5) from the 1960s to the present day. She argued that the epistemological assumptions of science and journalism do not fit very well: on the one hand, the increasing accuracy of the computer-based scientific prediction models led to greater reliability of the findings, but, on the other hand, it also became possible and necessary to differentiate the general predictions taking a great variety of influencing factors into account. This in turn had the effect that a number of the early disaster scenarios had to be revised and covered in a more nuanced manner: the findings of climate research were portrayed as less catastrophic than in the beginning. Gramelsberger (2007) argues that as a result of these changes in media reporting readers would probably be more sceptical about negative predictions of climate researchers. Peters and Heinrichs (2008) hypothesized similar effects. According to their arguments, even single statements in the press which categorize the consequences of climate change as less dramatic or deny the influence of humankind on climate change could make readers unsure about how believable scientific predictions of climate change really are.

Receiver-centred studies have demonstrated that these communicative interrelationships between scientific findings, media coverage and the public understanding of climate change cannot be described by a simple transmission model. Focusing on New

Zealand, Bell (1994), for example, found that people overestimated the consequences of the climate change models presented in media regarding rising sea-levels and temperature and confused greenhouse effect and climate change. Schulz (2003) examined the link between self-professed knowledge of environmental problems, environmental awareness and topic-specific media usage on the basis of a secondary analysis of the Eurobarometer survey data from 1999 for the 15 member states of the European Union at the time. Media usage was operationalized via an index of print media, television and radio usage. The results showed a significant positive correlation between *topic-specific media usage* and the scale of self-professed knowledge of environmental topics, including simultaneous multivariate control for sociodemographic variables and indicators of ecological orientation (Schulz, 2003: 393). A comparison of media showed that television usage was the weakest predictor and print usage the strongest for the self-professed level of knowledge related to environmental issues. Additionally, positive correlations were seen between media usage and environmental awareness of EU citizens. The findings showed that media usage was the strongest variable in explaining environmental awareness for the case that people had no personal experiences with the environmental problem under consideration. Holbert et al. (2003) analysed the connections between environmental concern, pro-environmental behaviour and different patterns of television viewing, differentiating between fact-based and fiction-based television usage. The results showed a positive effect of fact-based television use on people's environmental activities, no relations were found with fiction-based television use. In contrast Lowe et al. (2006) found that the film *The Day After Tomorrow* had at least a short-term effect on filmgoers' attitudes: after having seen the film they were more concerned about climate change than before. Sampei and Aoyagi-Asui (2009) analysed mass media coverage on climate change in Japan from 1998 until July 2007 and its influence on public awareness of the problem. Their findings revealed agenda-setting effects: 'Along with the increase in mass-media coverage, public concern for global warming increased dramatically from January 2007' (Sampei and Aoyagi-Asui, 2009: 210). In addition, Zhao (2009) found that more newspaper reading as well as more frequent web use showed positive effects on self-professed knowledge, while television use seemed to have no effects. The study also pointed out that media use and climate change perceptions influence people's future information-seeking behaviour as well.

Summary and consequences for a theoretical model

The studies cited above examine the targeted selective usage of environment-related information. However, the general results of media usage research show that the conscientious attention to specific content is driven by individual interests and needs (Bryant and Zillmann, 2002). In light of this, the links ascertained between thematic media usage and environmental awareness could be ascribed primarily to the selective attention of the recipients. People who are inherently concerned and involved use corresponding sources of information more intensely, while others tend to avoid them. In the case of prominent topics such as climate protection, however, it can be expected that corresponding media reports reach even those who are not personally motivated to actively seek out information about such a topic but instead use the traditional mass media as a source of

information about general societal happenings without favouring or avoiding specific issues. Based on this, one can differentiate between an *active pursuit of information* on the topic of climate change and a *passive exposure to information* through contact with media reports that deal with climate change (Bonfadelli, 2002). In light of the effect potential of the media, the primary issue is whether media content succeeds in overcoming the 'protective wall' of selective perception (Donsbach, 1991). For this reason, it makes sense not to limit analysis to topic-specific media usage but to expand it to include media usage for general informational purposes.

The interpretation of a correlation between media use and attitudes as the *effect* of media content and not as the result of *selective* media use is much more plausible when general indicators of media use are applied: it is not very likely that a person selects a specific newspaper just because of his/her attitudes towards a specific issue like climate change. It is much more problematic to claim media effects when the selective usage of specific media content is measured, because in this case the argumentation can be reversed easily: people being highly concerned about environmental problems probably read columns about environmental issues more frequently than people without such attitudes. That is the reason why general media use is applied as the indicator and not issue-specific media use.

Accordingly, we posed the question of whether it is possible to detect effects of topic-unspecific information usage on environmental awareness. Following the findings of Schulz (2003), who demonstrated differential effects of various media, our study also takes a similar multifaceted approach to informational media usage. It compares the effects of public and commercial television usage as well as the impact of various print and online media.

To explore these connections, we developed a theoretical model specifically for the topic of climate change, based on the concepts from environmental awareness research described earlier. In the following, we explain what dimensions from environmental awareness research were integrated into the variable model.

Awareness of climate problems is defined here as an attitude construct, comprising both cognitive and affective components. The cognitive component is directly related to the perception of climate change as a problem ('The numerous storms and the warm winters make it clear that climate change is taking place'). The affective component is expressed concretely in the perceived threat from climate change ('Climate change is one of the greatest threats to humankind'). This definition specifically excludes the behavioural component, which is considered in the model to be an independent construct in the form of climate-related behavioural intentions. These intentions are reflected in three different levels of abstraction: making investments, changing lifestyle and getting involved in societal relevant activities.

Variable model and empirical methods

Based on the previously described theoretical considerations and empirical results, a variable model (Figure 1) was developed to serve as the foundation for the subsequent analyses.

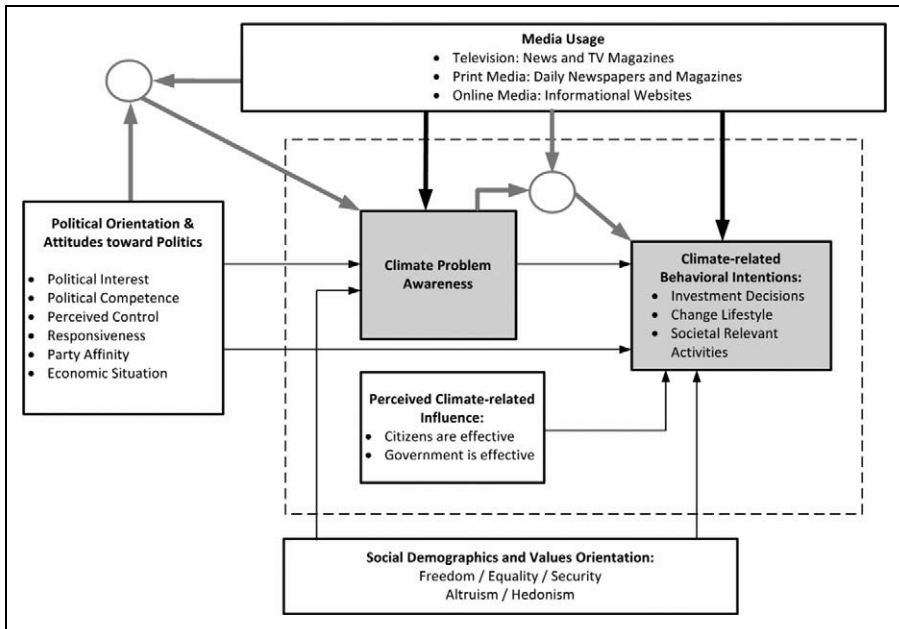


Figure 1. The variable model

Note: The expected media effects of particular interest here are indicated by bold lines. The two interaction effects are indicated by grey lines and circles.

The main focus of the study model is the connection between citizens' media usage, on the one hand, and awareness of climate problems and climate-related behavioural intentions, on the other. In order to accurately determine the effect of media, additional factors of influence must be statistically controlled for. Based on the main findings from the investigations cited in the previous section, the dimensions of perceived (climate-related) control, personal values (values orientation) and sociodemographic variables were taken into consideration as additional determinants of influence.

The perceived climate-related control in the model involves the individual level, on the one hand ('If each individual changes his/her behaviour, climate change can be stopped'), and the state level, on the other ('The governments of the world will succeed in stopping climate change'). Lifestyles and value orientation here relate concretely to equality, freedom, security,³ altruism and hedonism.

Concerning the theoretical assumptions and findings from earlier studies, it is not predictable whether positive or negative effects of media use will dominate in Germany's case. But all in all, we expect predominantly positive effects on attitudes and behaviour, therefore the following general hypotheses are tested:

Hypothesis 1a: Informational media use has a positive influence on people's climate change awareness.

Hypothesis 1b: Informational media use has a positive influence on people's behavioural intentions to act against climate change.

It will also be checked whether interaction effects can be identified. By doing this, it is assumed that media have stronger effects on the climate problem awareness of those who are interested in politics than those who are not. This expectation can be justified theoretically by the fact that persons interested in politics consciously select more and actively process political content. This means that initial attitudes would play a greater role for those persons who are actively interested in politics:

Hypothesis 2a: Informational media use has especially a positive influence on people's climate change awareness, if these people are highly interested in politics.

Furthermore, it is also assumed that the media effect on the behavioural intentions of those with greater awareness of climate problems will be stronger than those with low awareness of problems. The justification for this presumption is analogous to the previously described interaction effect:

Hypothesis 2b: Informational media use has especially a positive influence on people's behavioural intentions to act against climate change, if these people are highly interested in politics.

All variable complexes taken into consideration in the investigation are shown in Figure 1. This means that the dependent variable in the first analysis step is climate problem awareness, while in the second analysis step it is climate-related behavioural intentions.

The following analyses are based on data from the fifth wave of a Germany-wide representative panel study from summer 2007 (after the publication of the IPCC report). The primary goal of the research project conducted at the Ilmenau Technical University was the investigation of Germans' adoption of online communication tools for political communication. But each of the survey rounds also included questions about a current political issue in addition to the questions related to the primary study topic. In 2007, climate change was selected as the current political issue. The project is funded by the German National Science Foundation (DFG). Data were collected in a telephone survey using the CATI (Computer Assisted Telephone Interviewing) method. To ensure representative data, first a 'random last digit' sample of German households with telephone connections was generated by the ZUMA Centre for Survey Research and Methodology, followed by a 'next birthday' selection in the household. The collected data were also weighted according to the results of the micro-census of the German Federal Statistical Office. A total of 1414 persons between the ages of 16 and 91 (52 percent female, 48 percent male) were surveyed.

Operationalization and descriptive results

Dependent variables: problem awareness and behavioural intentions. Climate problem awareness was operationalized with a total of five items, measuring different aspects of the concept: acceptance/reluctance of the existence of the problem, evaluation of the hazardousness and appraisal of the consequences (Table 1). Two of the five items were formulated in such a manner that agreeing with these statements indicates strong climate problem awareness, while agreement with the other three items shows low climate problem awareness. The results clearly confirm that the German population possessed pronounced climate problem awareness at the time of the survey. At least 65 percent of those surveyed expressed strong problem awareness in all five questions.

Table 1. Climate problem awareness

Items ('Climate change and how to reduce harmful gas emissions is a popular topic of discussion at the moment. I would like to find out your opinion on the following statements')	<i>M</i> (SD) ^a	Climate problem awareness	
		Low ^b	High ^c
Climate change is one of the greatest threats to humankind.	3.3 (0.9)	20%	80%
The numerous storms and the warm winters make it clear that climate change is taking place.	3.2 (1.0)	26%	74%
It wouldn't be so bad if climate change made it a few degrees warmer in Germany. (scale is flipped)	3.0 (1.1)	30%	70%
It is not at all clear that climate change actually exists. (scale is flipped)	2.9 (1.1)	34%	66%
Climate change is not as dangerous as we are told. (scale is flipped)	2.9 (1.1)	35%	65%
Problem awareness ^d . (alpha = .68)	3.1 (1.1)		

Notes: ^a Mean (*M*) and standard deviation (SD) on a 4-point scale of 1 'do not agree at all' to 4 'agree completely'. ^b Points 1 and 2 on the scale. ^c Points 3 and 4 on the scale. ^d Overall scale of 5 items. *N* = 1364–1413.

Climate-related behavioural intentions were measured using a total of seven items, which were subsequently subjected to factor analysis. Three dimensions were identified as a result (Table 2). The first dimension, 'Make investments' to protect the environment consists of two purchases: energy-saving light bulbs and energy-efficient household appliances. There was not only strong verbal commitment to these investment activities, but many respondents had already taken action in this respect: 76 percent reported already using energy-saving light bulbs and 47 percent said they had decided to acquire energy-efficient household appliances. Only a small minority, 4 percent and 9 percent respectively, rejected these purchases.

The second factor, 'Change lifestyle', summarizes three activities associated with changes in individual lifestyle, including limiting mobility and lifestyle comforts. These measures were likewise already practised by many of those surveyed: 47 percent said they fly less than they used to, 51 percent drive less and 57 percent even said they don't heat as much. However, it can be observed that approximately one-fifth of respondents in each case were not willing to change their own lifestyle with respect to the three factors cited in order to protect the climate.

What is common to the first two factors is that activities in these areas not only preserve the climate; they also have an immediate or mid-range positive effect on personal finances. This is also likely to be an indicator for the high acceptance of these measures. The situation was different for the third factor, 'Societal relevant behavioural intentions', which comprises the two decisions of using 'green electricity' and actively promoting climate protection. These two climate protection activities do not yield direct individual material benefits and in fact consume additional personal resources. Only 3 percent of survey participants were already politically active in protecting the climate or environment, and only 5 percent used green electricity. The majority (52 percent) were unwilling to consider green electricity, while just under one-third (31 percent) could not imagine becoming politically active.

Table 2. Climate-related behavioural intentions (factor analysis)

'There are a number of suggestions for what one can do to protect the climate. I will now mention several such activities:'	Make investments	Change lifestyle	Societal relevant behavioural intentions
Purchase more expensive household appliances that conserve energy.	.79		
Use energy-saving light bulbs	.73		
Travel less by airplane.		.76	
Drive considerably less.		.71	
Heat less at home.		.60	
Sign up for more expensive 'green electricity.'			.78
Become active in promoting the government to pass stricter laws to stop climate change.			.76
Eigenvalue.	1.06	1.96	0.98
Scale mean ^a . (standard deviation)	2.5 (0.5)	2.3 (0.6)	1.6 (0.4)
N	1412	1412	1407

Notes: Primary component analysis with varimax rotation; settings: 3 factor solutions; 57% explained variance; all factor loadings > .30.

^a Scale mean of 7 items on a scale of 1 'Would not do', 2 'Would be willing to do', 3 'Already do'.

Independent variables: media usage. The independent variables in the investigation were the various indicators of political media usage of television, print media and the internet. To determine the influence of television, the usage of two types of media was recorded: political television magazines, on the one hand, and news broadcasts, on the other. For the news, not only the general frequency of news usage was determined, but also what broadcasts were preferred. On this basis, it was possible not only to ascertain how frequently survey participants generally watched the news, but to calculate their TV system preference, i.e. whether they preferred public or commercial channels for their news. This made it possible to examine the differential effects of television.⁴

In terms of print media, the general frequency of reading the daily newspaper was weighted with interest in the political and business sections to obtain an indicator of the *political daily newspaper usage*. Second, the reading of *Der Spiegel*, *Die Zeit* and/or *Focus* (weekly magazines/newspapers⁵) was used to indicate *print magazine usage*. In order to examine the differential media effects in the print domain, an additional preference variable was calculated (similar to TV) by comparing the two political, rather liberal print media (*Spiegel* and *Zeit*) with the magazine *Focus*.⁶

To investigate the influence of informational online usage, the usage intensities of a total of five internet sites of established offline media were combined into an index.⁷

Control variables: A large amount of available control variables were included in the data analysis to assure the study's findings. The control variables were subdivided into three blocks (Table 3). Of particular interest in this investigation is the perceived influence of government and citizen involvement in combating climate change. The results in Table 3 show that for the most part the population was overall sceptical about the anticipated

Table 3. Perceived climate-related influence

	<i>M</i> (<i>SD</i>) ^a	Perceived climate-related influence	
		Low ^b	High ^c
The governments of the world will succeed in stopping climate change.	2.0 (0.9)	78%	22%
If each individual changes his/her behaviour, climate change can be stopped.	3.1 (1.0)	26%	74%

Notes: ^aMean (*M*) and standard deviation (*SD*) on a 4-point scale of 'do not agree at all' to 4 'agree completely'.

^b Points 1 and 2 on the scale. ^c Points 3 and 4 on the scale. *N* = 1382–1393.

success of government in climate policy, whereby respondents had considerably higher expectations for the collective efforts of the population.

The second large block of control variables comprises political orientation, including political interest and self-assessment of political competence as well as variables that could be considered indicators of basic political orientations: it seems plausible that general perceived political efficacy and the assessment of politician responsiveness could have an influence on political behavioural intentions.⁸ Forty-three percent of respondents described their political interest as strong. On the other hand however, only 6 percent rated their political competence as high. Citizens were also sceptical about the responsiveness of politicians: only 11 percent had no doubts in this area. Perceived general political efficacy was hardly any higher: only 21 percent of survey participants were convinced they had any influence on government actions.

Especially for environmental topics, the basic political attitude of respondents can be of significance. *Party identification* was chosen as an indicator of this for the study. Furthermore, the balance between ecology and economy almost always plays a role in the debate on environmental politics and public media (Jacob, 2008). Consequently, the subjective assessment of the *economic situation* was integrated into the model as an additional control variable.⁹

The third large block of control variables comprises value orientations and sociodemographic variables. The relative importance of the basic political values of freedom, equality and security, in addition to a question about altruism and one about hedonism, were measured in the study and taken into consideration in the analysis. A preference for the value of security was observed in 29 percent, for equality in 22 percent and for freedom in 20 percent. Altruism was highly pronounced in survey participants: 57 percent said it was especially important to them to help others.¹⁰ Further the sociodemographic variables of age, formal education and sex of respondents were taken into consideration.

Analysis results

Regression analyses were conducted to test the links postulated in Figure 1. In the first step the partial model for climate problem awareness (indicated by dashed lines) was analysed. Thereby only significant explanatory variables were integrated into the model.

Table 4. Regression analysis for climate problem awareness

	Beta coefficients	
	Basic model	With interaction
Public TV news (frequent)	.06	
Public TV news (frequent) * Political interest (high)		.10
Weekly print media usage (yes)	-.06	-.06
Political interest (high)	.07	
Altruism (very pronounced)	.11	.11
Perceived general political influence (high)	.09	.09
Affinity for the Green Party (yes)	.14	.14
R^2	.06	.06
N	1367	1367

Note: All coefficients in the model are statistically significant for $p < .05$.

The results (see Table 4) show that awareness of climate problems cannot be explained very well by the given variables in the model. However, it can be seen that although the influence of the particularly interesting variable of media usage is admittedly small, it may help explain climate awareness, even when control variables are taken into consideration. The demonstrated effects make it clear that differential effects of media on environmental awareness can actually be observed. Respondents who inform themselves via public news programmes had a greater awareness of climate problems than those who did not watch any news or watched only commercial programmes. The usage of weekly print media, on the other hand, had a slightly negative effect on problem awareness, so that we cannot confirm hypothesis 1a in general.

The calculation of the interaction model shows that the effect of television on those interested in politics is even slightly stronger. The influence of print media in contrast is not modified by political interest. Although the ascertained influences of the media are relatively small, if one considers that these effects cannot be accounted for by topic selectivity and that ideological aspects were additionally controlled for via party preference, it certainly seems that the observed differences in problem perception are actually related to differences in reporting. Hence we can partially verify hypothesis 2a.

In the next analysis step, the explanatory model for the various behavioural intentions was calculated. Once again, the influence of media usage variables could be demonstrated in all cases, but the predictive power of the models varied considerably. Whereas planned *climate-related investment decisions* can hardly be better explained than *climate problem awareness*, the *societal relevant activities* can be significantly better predicted.

The intention to invest in energy-efficient household appliances is promoted by frequent usage of television magazines covering political topics. This general media effect is even stronger among those with strong climate awareness (Table 5 – second column). Therefore we can affirm the hypotheses 1b and 2b. Interpreting these results, it is important to note that awareness of climate problems does not have a direct effect on behavioural intentions. Deciding for or against energy-efficient household appliances is

Table 5. Regression analysis for behavioural intentions I: Climate-related investment decisions

	Beta coefficients	
	Basic model	With interaction
Political television magazines (frequent)	.09	
Political television magazines (frequent) *		.10
Climate problem awareness (high)		
Perceived citizen influence (high)	.16	.15
Hedonism (high)	-.06	-.06
Age (high)	.09	.09
Sex (male)	-.14	-.14
R^2	.08	.09
N	1312	1312

Note: All coefficients in the model are statistically significant for $p < .05$.

not influenced by problem perception, but a corresponding problem awareness facilitates the media effect on these *societal relevant activities*.

In contrast to planned investments, media usage has a negative effect on willingness to change lifestyle (see Table 6 – first column). Similar to the first model, it can be seen again here that those who used weekly print media not only had lower problem awareness, they were also less willing to change their own lifestyle to benefit the climate. Reading these print media significantly reduces willingness to live without certain conveniences, as expected by Gramelsberger (2007). Interactions with problem awareness cannot be observed here, but because hypothesis 2b predicts only a strengthening of positive effects, the hypothesis has to be accepted here. In contrast to the explanatory model for investment intentions, however, problem awareness has a direct effect here. And not only the perception of climate change problems turned out to be relevant for behaviour, but also the perceived influence of citizens to stop climate change.

How can the differences between the two behavioural intentions be explained? In many cases, the decision to use energy-saving light bulbs and an energy-efficient refrigerator is probably made for economic reasons, as the buyer can count on amortizing the investment after a period of time. Likewise, the decision to drive, fly or heat one's home less is undeniably economically motivated, but such savings measures have a much greater impact on daily life. The results show that to commit to such plans, correspondingly high problem awareness and perceived influence of citizen action are relevant.

Another picture arises when we consider the factors that influence *societal relevant activities* (Table 6 – second and third columns). Compared to all other previously analysed dimensions, both for environmental awareness and behavioural intentions, intentions related to exerting political influence can be much better explained. The positive media effects dominate in this model: the usage of public news programmes is shown to promote climate protection, similar to the first model. Reading weekly print media also enhances willingness to get involved politically to protect the environment. Although these results show that print media have no effect on investment intentions and a negative effect on willingness to change lifestyle, they are nonetheless politically

Table 6. Regression analysis for behavioural intentions II

	Beta coefficients		
	Change lifestyle	Societal relevant activities	
	Basic model	Basic model	With interaction
Public TV news (frequent)	–	.07	.07
Weekly print media usage (yes)	–.07	.05	–
Online information usage (frequent)	–	.07	–
Online information usage (frequent) *	–	–	.09
Climate problem awareness (high)	–		
Political interest (high)	–	.06	.07
Perceived general political influence (high)	–.07	–	–
Affinity for the Green Party (yes)	.06	.10	.11
Equality (significant preference)	.08	.08	.08
Altruism (pronounced)	–	.08	.08
Hedonism (high)	–.07	–	–
Age (high)	.09	–	–
Sex (male)	–.15	–	–
Education (high)	–	.08	.08
Perceived governmental influence (high)	–	.14	.14
Perceived citizen influence (high)	.12	.16	.16
Climate problem awareness	.13	.21	.20
R^2	.12	.21	.21
N	1316	1316	1316

Note: All coefficients in the model are statistically significant for $p < .05$.

mobilizing. The same holds true for informational online usage, which appears as a significant factor of influence for the first time in this analysis, so that summarizing we can accept hypothesis 1b. And because at least online usage has a mobilizing effect primarily on those with higher awareness of climate problems, we validate hypothesis 2b as well, but only partially. But climate awareness has a stronger, more direct effect here. It can also be seen that the intention of getting involved in *societal relevant activities* is significantly positively influenced by both perceived citizen and governmental influence.

Summary and outlook

The results of the investigation show that media usage and awareness of climate problems have complex effects on the various behavioural intentions. Problem awareness was observed to have no direct effect on intentions to make investments, and only an indirect effect through the interaction of problem awareness and usage of political television magazines.

The situation was different for the more drastic behavioural intentions involving a lifestyle change, i.e. willingness to give up certain conveniences. Whereas no influence was observed for television news and online media, the usage of weekly print media had a negative effect on the intention to change lifestyle. The partially negative effects of the

weekly print media in particular were not anticipated to this extent. But the results of previous content analysis studies of print media (Gramelsberger, 2007; Peters and Heinrichs, 2008) support the hypothesis that reporting on climate change does not necessarily lead to the conviction that human-caused climate change actually exists. Awareness of climate problems and perceived citizen control, on the other hand, have a direct effect on behavioural intentions, especially to become more politically engaged in *societal relevant activities*. It is interesting to note, however, that this form of behavioural intention is positively influenced by using various media sources and that the strongest media effects in general can be observed in those cases of high usage of various media: that means public television news, print media and online information media.

Regarding the media effects on everyday behaviour identified in this study, it can be seen that the usage of informational media only has a significant positive influence on everyday climate-related behavioural intentions when the actions are quickly realizable, have an individual economic benefit, or when it involves having an influence on politics. No positive effect of media usage was observed on long-term changes in individual behaviour whose effects on climate protection are more long-range and cannot be directly experienced. Perceived control of climate change by individuals and awareness of climate problems instead have the primary influence on behaviour. The effect potential of the media is apparently insufficient to influence environment-related behavioural intentions in the long range. The potential of mass media reporting lies more in promoting a stable awareness of climate problems at the attitude level. In this way, media may indirectly cause long-term changes in lifestyle.

The findings differ both with respect to the various dependent variables and across different media. The fact that media do not always have a motivating, awareness-heightening effect is certainly one of the most striking results of this study. These differential findings raise the question of the differences in content between the various media offerings. Additionally, a promising avenue for future research would be a longitudinal study, which also takes changes in media coverage into account. Future research will involve investigating the causes of the differential media effects. The direct combination of content analysis and survey studies will be necessary to achieve this.

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Notes

1. *Bild* sold 3,540,785 copies in 2Q/2007 and in 3Q/2007 3,586,841 copies were sold. The amount of copies sold is listed at www.ivw.de, which tracks the circulations of all German printed publications. *Bild* is the sixth highest selling daily newspaper worldwide (www.wan-press.org/article2825.html).
2. *Die Süddeutsche Zeitung* sold 424,250 copies in 2Q/2007 and 412,295 copies in 3Q/2007 (www.ivw.de).
3. Example of question wording: 'What objective should be more important in your opinion: personal freedom, in other words that everyone can live in freedom and develop unhindered – or a

- maximum of equality, in other words that no one is disadvantaged and social differences are not so great?' The other basic political values were measured via similar comparisons.
4. *Usage of political television magazines*: 'How often do you watch political magazines on television, in other words programmes that report on political events and their background?' (3 = several times per week, 2 = several times per month, 1 = less frequently). *Usage of TV news*: 'How often do you watch the news on television?' (5 = daily, 1 = fewer than several times per month). *TV system preference*: 'Which news broadcasts do you watch most frequently?' Response of German commercial networks RTL, SAT1, PRO7, N24, ntv and/or RTL2 = indicator of commercial preference; response of German public broadcasters ARD, ZDF, Dritte Programme and/or Phoenix = indicator of public preference. To determine the overall system preference, the number of commercial news broadcasts cited was subtracted from the number of public broadcasts cited. This yielded an 11-point scale (+4 = only the four public networks to -6 = only the six commercial channels). Empirically, a 7-point scale resulted, ranging from +3 to -3.
 5. In 2Q/2007 *Der Spiegel*, the leading weekly news magazine in Germany, sold 1,051,113 copies, in 3Q/2007 1,078,981 were sold. *Focus* is the third largest weekly news magazine, targeting a conservative and economic-liberal audience. *Focus* sold 728,104 copies in 2Q/2007, and 711,170 in 3Q/2007. *Die Zeit* is said to be oriented towards social democracy. *Die Zeit* sold 502,246 copies in 2Q/2007 and 480,232 in 3Q/2007. The number of copies sold is listed at www.ivw.de, which tracks circulations of all German printed publications.
 6. *Political daily newspaper usage*: Multiplication of usage frequency with interest in the political section. Usage frequency of the daily newspaper: 'On how many days per week do you read a daily newspaper?' Interest in political section: 'I will now mention a range of topic areas from the daily newspaper; please tell me how generally interested you are in them.' Example: Politics (1 = relatively little, 3 = strong). *Weekly print media usage*: 'Do you read news magazines or weekly magazines?' (1 = yes, 0 = no). *Print magazine preference*: To operationalize the weekly magazine preference, readers who use *Spiegel* or *Zeit* were assigned the value of 1, those who read *Focus* were assigned the value -1, while those who use no magazine or use both a liberal and a conservative magazine were given the value 0.
 7. *Online information usage*: 'I will now mention the names of a few websites, and would like to know if you have visited these sites in the past year.' Included were: Spiegel Online, Focus Online, Süddeutsche Online, FAZ.net and websites of public broadcasters such as ARD, ZDF or DeutschlandRadio. For positive responses, participants were then asked: 'And how often did you visit this site in the past year? Was it daily (4), several times per week (3), several times per month (2) or less frequently (1)?' An additive index was generated from the five measurements.
 8. *Political interest*: 'How strong is your general interest in politics?' (1 = weak, 2 = medium, 3 = strong). *Competence*: 'What happens in politics is sometimes hard to understand!' *General perceived political influence*: 'As a simple citizen, one doesn't have any influence on what the government does anyway!' *Responsiveness*: Politicians don't care much what people think! (for all three items: 3 = tend to disagree, 2 = agree partially, 1 = agree completely).
 9. *Affinity for the Green Party*: 'Many people have an affinity for a political party that they find particularly appealing. How about you: do you tend towards a certain political party? If "yes": "Which one?" (1 = Greens, 0 = none or other party). *Economic situation*: 'What is your general opinion of the current economic situation in Germany?' (very good = 4, relatively good = 3, not very good = 2, very bad = 1).

10. *Freedom, equality, security*: 'There are numerous objectives in politics which are all highly important. But if you had to make a choice, which objective should be more important in your opinion: personal freedom, in other words that everyone can live in freedom and develop unhindered – or a maximum of equality, in other words that no one is disadvantaged and social differences are not so great?' 'And what if you had to choose between a maximum of security, in other words that one could be certain about the future, and a maximum of equality?'

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